

1 CLAIMS:

2 1. A semiconductor processing method of forming field effect
3 transistors comprising:

4 forming a first gate dielectric layer over first and second areas of
5 a semiconductor substrate, the first area being configured for forming
6 p-type field effect transistors, the second area being configured for
7 forming n-type field effect transistors;

8 removing the first gate dielectric layer from over one of the first
9 and second areas and leaving the first gate dielectric layer over the
10 other of the first and second areas;

11 after the removing, forming a second gate dielectric layer over the
12 other of the first and second areas;

13 forming transistor gates over the first and second gate dielectric
14 layers; and

15 forming p-type source/drain regions proximate the transistor gates
16 in the first area and n-type source/drain regions proximate the transistor
17 gates in the second area.

18
19 2. The semiconductor processing method of claim 1 wherein the
20 removing comprises removing the first gate dielectric layer from over the
21 first area.

1 3. The semiconductor processing method of claim 1 wherein the
2 removing comprises removing the first gate dielectric layer from over the
3 second area.

4

5 4. The semiconductor processing method of claim 1 wherein the
6 first gate dielectric layer is different in composition relative the second
7 gate dielectric layer.

8

9 5. The semiconductor processing method of claim 1 wherein the
10 first gate dielectric layer is of a different thickness relative the second
11 gate dielectric layer.

12

13 6. The semiconductor processing method of claim 1 wherein the
14 first gate dielectric layer is different in composition and is of a different
15 thickness relative the second gate dielectric layer.

16

17

18

19

20

21

22

23

1 7. The semiconductor processing method of claim 1 wherein the
2 first gate dielectric layer comprises an oxide having nitrogen atoms
3 therein, the nitrogen atoms being higher in concentration within the first
4 gate dielectric layer at one elevational location as compared to another
5 elevational location, and the ~~second~~ gate dielectric layer being different
6 in composition from the first gate dielectric layer.

7
8 8. The semiconductor processing method of claim 1 wherein the
9 first gate dielectric layer comprises an oxide having nitrogen atoms
10 therein, the nitrogen atoms being concentrated within the first gate
11 dielectric layer at a location proximate an interface of the first gate
12 dielectric layer with the semiconductor substrate, and the second gate
13 dielectric layer being different in composition from the first gate
14 dielectric layer.

15

16

17

18

19

20

21

22

23

1 9. The semiconductor processing method of claim 1 wherein the
2 first gate dielectric layer comprises silicon dioxide having nitrogen atoms
3 therein, the nitrogen atoms being higher in concentration within the first
4 gate dielectric layer at one elevational location as compared to another
5 elevational location and at a concentration of from 0.1% molar to 10.0%
6 molar, and the second gate dielectric layer comprises silicon dioxide
7 material proximate an interface of the second gate dielectric layer with
8 the semiconductor substrate which is substantially void of nitrogen atoms.

9
10 10. The semiconductor processing method of claim 1 wherein the
11 first gate dielectric layer comprises an oxide.

12
13 11. The semiconductor processing method of claim 1 wherein the
14 second gate dielectric layer comprises an oxide.

15
16
17
18

19

20

21

22

23

1 12. A semiconductor processing method of forming field effect
2 transistors comprising:

3 forming a first gate dielectric layer over first and second areas of
4 a semiconductor substrate, the first area being configured for forming
5 p-type field effect transistors, the second area being configured for
6 forming n-type field effect transistors, the first gate dielectric layer
7 comprising silicon dioxide having nitrogen atoms therein, the nitrogen
8 atoms being higher in concentration within the first gate dielectric layer
9 at one elevational location as compared to another elevational location
10 and at a concentration of from 0.1% molar to 10.0% molar;

11 removing the first gate dielectric layer from over the second area
12 and leaving the first gate dielectric layer over the first area;

13 after the removing, forming a second gate dielectric layer over the
14 second area, the second gate dielectric layer comprising silicon dioxide
15 proximate an interface of the second gate dielectric layer with the
16 semiconductor substrate which is substantially void of nitrogen atoms;

17 forming transistor gates over the first and second gate dielectric
18 layers; and

19 forming p-type source/drain regions proximate the transistor gates
20 in the first area and n-type source/drain regions proximate the transistor
21 gates in the second area.

1 13. The semiconductor processing method of claim 12 wherein
2 the one elevational location is located proximate an interface of the first
3 gate dielectric layer with the semiconductor substrate.

4

5 14. The semiconductor processing method of claim 12 wherein
6 the second gate dielectric layer is formed to at least initially cover all
7 of the first and second areas.

8

9 15. The semiconductor processing method of claim 12 wherein
10 the second gate dielectric layer is formed to at least initially cover a
11 majority of the second area.

12

13 16. The semiconductor processing method of claim 12 wherein
14 the second gate dielectric layer is formed to at least initially cover only
15 the second area.

16

17 17. The semiconductor processing method of claim 12 wherein
18 the first gate dielectric layer is of a different thickness relative the
19 second gate dielectric layer.

1 18. A semiconductor processing method of forming field effect
2 transistors comprising:

3 forming a first gate dielectric layer over a first area of a
4 semiconductor substrate configured for forming p-type transistors and a
5 second gate dielectric layer over a second area of the semiconductor
6 substrate configured for forming n-type transistors, the first gate dielectric
7 layer comprising an oxide having nitrogen atoms therein, the nitrogen
8 atoms being higher in concentration within the first gate dielectric layer
9 at one elevational location as compared to another elevational location,
10 the second gate dielectric layer being different in composition from the
11 first gate dielectric layer;

12 forming transistor gates over the first and second gate dielectric
13 layers; and

14 forming p-type source/drain regions proximate the transistor gates
15 in the first area and n-type source/drain regions proximate the transistor
16 gates in the second area.

17
18 19. The semiconductor processing method of claim 18 wherein
19 the one elevational location is located proximate an interface of the first
20 gate dielectric layer with the semiconductor substrate.

1 20. The semiconductor processing method of claim 18 wherein
2 the concentration of nitrogen atoms within the first gate dielectric layer
3 at the one elevational location is from 0.1% molar to 10.0% molar.

4

5 21. The semiconductor processing method of claim 18 wherein
6 the first gate dielectric layer is formed before the second gate dielectric
7 layer.

8

9 22. The semiconductor processing method of claim 18 wherein
10 the second gate dielectric layer is formed before the first gate dielectric
11 layer.

12

13 23. The semiconductor processing method of claim 18 wherein
14 the first gate dielectric layer comprises silicon dioxide.

15

16 24. The semiconductor processing method of claim 18 wherein
17 the first gate dielectric layer is of a different thickness relative the
18 second gate dielectric layer.

1 25. The semiconductor processing method of claim 18 wherein
2 the first gate dielectric layer is initially formed over the first and second
3 areas.

4

5 26. The semiconductor processing method of claim 18 wherein
6 the second gate dielectric layer is initially formed over the first and
7 second areas.

8

9 27. Integrated circuitry comprising a semiconductor substrate
10 having an area within which a plurality of n-type and p-type field effect
11 transistors are formed, the respective transistors comprising a gate, a gate
12 dielectric layer and source/drain regions, the gate dielectric layer of the
13 p-type field effect transistors comprising an oxide having nitrogen atoms
14 therein, and the nitrogen atoms being higher in concentration within the
15 gate dielectric layer at one elevational location as compared to another
16 elevational location, the gate dielectric layer of the n-type field effect
17 transistors being different in composition from the gate dielectric layer
18 of the p-type field effect transistors.

19

20 28. The integrated circuitry of claim 27 wherein the gate
21 dielectric layer of the p-type transistors comprises silicon dioxide.

1 29. The integrated circuitry of claim 27 wherein the gate
2 dielectric layer of the p-type transistors are of a different thickness
3 relative the gate dielectric layer of the n-type transistors.

4
5 30. The integrated circuitry of claim 27 wherein the concentration
6 of nitrogen atoms in the gate dielectric layer of the p-type transistors
7 at the one elevational location is from 0.1% molar to 10.0% molar.

8
9 31. The integrated circuitry of claim 27 wherein the one
10 elevational location is located proximate an interface of the gate
11 dielectric layer with the semiconductor substrate.

12
13
14
15
16
17
18
19
20
21
22
23

1 32. Integrated circuitry comprising a semiconductor substrate
2 having an area within which a plurality of n-type and p-type field effect
3 transistors are formed, the respective transistors comprising a gate, a gate
4 dielectric layer and source/drain regions, the gate dielectric layer of the
5 p-type field effect transistors comprising silicon dioxide having nitrogen
6 atoms therein, the nitrogen atoms being higher in concentration within
7 the gate dielectric layer at one ~~elevational~~ location as compared to
8 another elevational location and at a concentration of from 0.1% molar
9 to 10.0% molar, the gate dielectric layer of the n-type field effect
10 transistors comprising silicon dioxide material proximate an interface of
11 the gate dielectric layer with the semiconductor substrate which is
12 substantially void of nitrogen atoms.

13
14 33. The integrated circuitry of claim 32 wherein the one
15 elevational location is located proximate an interface of the gate
16 dielectric layer with the semiconductor substrate.

17
18
19
20
21
22
23

1 34. A semiconductor processing method of forming field effect
2 transistors comprising:

3 providing a continuous area over a semiconductor substrate for
4 formation of n-type and p-type field effect transistors, the transistors
5 respectively comprising a gate, a gate dielectric layer and source/drain
6 regions; and

7 forming a predominate portion of the gate dielectric layers of the
8 p-type transistors in the first continuous area prior to forming a
9 predominate portion of the gate dielectric layers of the n-type transistors
10 in the first continuous area.

11
12 35. The semiconductor processing method of claim 34 wherein
13 the gate dielectric layer of the p-type transistors comprise an oxide
14 having nitrogen atoms therein, the nitrogen atoms being higher in
15 concentration within the gate dielectric layer at one elevational location
16 as compared to another elevational location.

17
18
19
20
21
22
23

1 36. The semiconductor processing method of claim 34 wherein
2 the gate dielectric layer of the p-type transistors comprise an oxide
3 having nitrogen atoms therein, the nitrogen atoms being concentrated
4 within the gate dielectric layer at a location proximate an interface of
5 the gate dielectric layer with the semiconductor substrate.

6

7 37. The semiconductor processing method of claim 34 wherein
8 the gate dielectric layer of the p-type transistors comprise an oxide
9 having nitrogen atoms therein and located proximate an interface of the
10 gate dielectric layer with the semiconductor substrate at a concentration
11 from 0.1% molar to 10.0% molar.

12 add 7 add 7
13 A 27 add 7
14 B
15
16
17
18
19
20
21
22
23